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**(S4) COMPOSITION FOR DERMATOLOGIC PREPARATION.**

(27) A composition for dermatologic preparation containing vitamin A (retinol) and a stabilizer comprising chelating agent/polysaccharide, oil, polyethylene (propylene) glycol, hydroxy carboxylic acid salt, neutral amino acid salt, oil-soluble antioxidant/EDTA/benzophenone compound, oil-soluble antioxidant/acid/benzophenone compound, a clathrate cyclodextrin containing antioxidant and/or ultraviolet absorber included therein, butanediol and/or oil-soluble antioxidant, water-soluble benzophenone compound, basic amino acid and its salt, acidic amino acid and its salt, polar oil, or water-swellaable clayey mineral.

**EP 0 608 433 A1**

## TECHNICAL FIELD

The present invention relates to an external skin treatment composition in which the stability of vitamin A is extremely improved.

## BACKGROUND ART

It has been well known that vitamin A is effective for prevention or treatment of keratodermatitis and, prevention of and recovery from dermal aging.

Vitamin A, however, is structurally very unstable and can readily cause isomerization, decomposition, polymerization, etc., with light, air, heat, metal ion, etc. Thus, it has been difficult to stably formulate vitamin A into an external skin treatment composition.

## SUMMARY OF THE INVENTION

Accordingly, the present invention relates to an external skin treatment composition in which the stability of vitamin A is extremely improved by formulating a stabilizer for improving the stability of vitamin A.

In accordance with the present invention, there is provided an external skin treatment composition comprising (I) vitamin A and (II) at least one stabilizer selected from the group consisting of (1) chelating agents and polysaccharides, (2) oils having an iodine value of 70 or more, (3) polyethylene glycol and or polypropylene glycol, (4) hydroxy carboxylates, (5) neutral amino acids, (6) (i) at least one oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha$ , $\beta$ , $\gamma$ , $\delta$ -tocopherol, nordihydroguaiaretin, propyl gallate, fatty acid esters of vitamin C and sorbic acid, (ii) at least one ethylenediaminetetraacetate and (iii) at least one benzophenone compound, (7) (i) at least one oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha$ , $\beta$ , $\gamma$ , $\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate and fatty acid esters of vitamin C, (ii) at least one compound selected from the group consisting of ascorbic acid, ascorbic acid salt, isoascorbic acid, isoascorbic acid salt, sorbic acid and sorbic acid salt and (iii) at least one benzophenone compound, (8) inclusion compounds of cyclodextrins including antioxidants and/or ultraviolet absorbers, (9) at least one kind of butanediol and/or at least one oil-soluble antioxidant, (10) at least one water-soluble benzophenone compound, (11) at least one compound selected from the group consisting of basic amino acids and the salts thereof, (12) at least one compound selected from the group consisting of acidic amino acids and the salts thereof, (13) at least one polar oil selected from the group consisting of pentaerythritol fatty acid esters and trimethylolpropane fatty acid esters, and (14) at least one water-swellable clay mineral.

## BEST MODE FOR CARRYING OUT THE INVENTION

In consideration of the above circumstances, the present inventors have conducted extensive study and research efforts. As a result, it has been found that the stability of vitamin A is extremely improved by formulating the specified stabilizer therein. Thus the present invention has been achieved.

The present invention will be described in detail below.

As vitamin A used in the present invention, vitamin A (also called retinol), all-trans type vitamin A or 13-cis type vitamin A is desirable. A mixture thereof can also be used.

The amount of vitamin A to be formulated into the external skin treatment composition according to the present invention is not particularly limited. However, if the effect on the skin as a function of vitamin A is taking into consideration, the amount is 0.0001% by weight or more, based upon the total weight of the composition. If further effects of vitamin A are required, 0.001% by weight or more of the same is preferably used. The upper limit of the formulation amount is preferably 1% by weight in view of the properties as an external skin treatment composition.

According to the first embodiment of the present invention, as a stabilizer, the combination of a chelating agent and a polysaccharide is used.

As a chelating agent used in the present invention, mention may be made of inorganic alkali salts of ethylenediaminetetraacetate such as sodium salts and potassium salts thereof, organic alkali salts of ethylenediaminetetraacetate such as ethanolamines salts thereof (mono, di, tri and tetra salts), citric acid and inorganic alkali salts of citric acid such as sodium and potassium salts thereof, organic alkali salts of citric acid such as ethanolamine salts and basic amino acid salts thereof (mono, di, tri salts); metaphosphoric acid salts, polyphosphoric acid salts, tartaric acid salts.

The amount of a chelating agent to be formulated in accordance with the present invention is 0.001% by weight or more and the upper limit of the formulation amount cannot be particularly limited. However, when an extremely large amount of the agent is formulated, although the effects of the present invention are not impaired, crystals of the agent are possibly deposited or undesirable phenomena may occur, so that qualities as external skin treatment compositions cannot be maintained. The formulation amount is preferably 1% by weight or less.

As polysaccharides used in the present invention, mention may be made of cellulose, quinsseed, chondroitin sulfate, starch, galactan, dermatan sulfate, glycogen, gum arabic, heparan sulfate, hyaluronic acid, gum tragacanth, keratan sulfate, chondroitin, gum xanthane, mucotin sulfate, guar gum, dextran, keratosulfate, locust bean gum, succinoglucon, charronin, and the salts thereof.

The amount of polysaccharides to be formulated into the external skin treatment composition of the present invention is not particularly limited in view of the effects of the present invention. However, it is preferably 0.00001 to 5.0% by weight.

In the second embodiment of the present invention, as oils having an iodine value of 70 or more to be formulated as a stabilizer, typically, mention may be made of plant oils belonging to the drying oil group such as linseed oil, tung oil, soybean oil, sunflower oil, walnut oil, eno oil, evening primrose oil, cherrykernel oil and grape seed; plant oils belonging to the nondrying oil such as sesame oil, rape seed oil, cotton seed oil, rice bran oil and wheat embryo bud oil; avocado oil; olive oil; camellia oil; macadamia nut oil; fish oils such as sardine oil, mackerel oil, herring oil, cod-liver oil, oyster oil.

In these oils, iodine values are, for example, 168 - 190 in linseed oil, 114 - 138 in soybean oil, 122 - 150 in sunflower oil, 94 - 107 in rape seed oil, 90 - 121 in cotton seed oil, 75 - 90 in olive oil, 73 - 87 in camellia oil, 136 - 195 in sardine oil, 99 - 119 in herring oil.

Further, among free fatty acids and higher alcohols derived from these fats and oils, those having an iodine value of 70 or more include, for example, oleic acid, palmitic acid, linoleic acid, linolenic acid, eleostearic acid,  $\gamma$ -linolenic acid, arachidonic acid, eicosapentaene acid, oleyl alcohol.

One or more kinds of these oils are formulated into the composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.01% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, qualities as external skin treatment compositions sometimes can be impaired. Thus caution should be taken not to impair the qualities. The formulation amount is particularly preferably 0.1 to 60% by weight.

According to the third embodiment of the present invention, as a stabilizer, one or two or more kinds of compounds selected from polyethylene glycol (PEG) and or polypropylene glycol (PPG) are formulated.

As PEG, PPG to be formulated in accordance with the present invention, PEG200, PEG300, PEG400, PEG1500, PEG4000, PEG6000, PEG20000 as well as PPG400, PPG750, PPG1200, PPG2000, PPG3000 have been typically known.

One or more kinds of these compounds are formulated into the composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.1% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, qualities as external skin treatment compositions sometimes can be impaired. Thus caution should be taken not to impair the qualities of the composition. The formulation amount is particularly preferably 1 to 80% by weight.

In the fourth embodiment of the present invention, as hydroxycarbonates included in the external skin treatment composition as a stabilizer, mention may be made of inorganic alkali salts such as sodium salts and potassium salts of citric acid, lactic acid, malic acid and tartaric acid, organic alkali salts such as ethanolamine salts and basic amino acid salts of citric acid, lactic acid, malic acid and tartaric acid (mono, di and tri salts are typically known).

One or two or more kinds thereof are included in the present composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.001% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, qualities as external skin treatment compositions sometimes can be impaired. Thus caution should be taken not to impair the qualities of the composition. The formulation amount is particularly preferably 0.01 to 1% by weight.

In the fifth embodiment of the present invention, as neutral amino acids included in the external skin treatment composition as a stabilizer, mention may be made of glycine, alanine, serine, phenylalanine, proline and hydroxyproline.

One or two or more kinds thereof are included in the present composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.001% by weight or

more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, the formulation amount exceeds individual solubility to possibly cause the precipitation of the crystals so that qualities as external skin treatment compositions sometimes can be impaired. Thus caution should be taken not to impair the qualities of the composition. The formulation amount is particularly preferably 0.01 to 10% by weight.

In the sixth embodiment of the present invention, as oil-soluble antioxidants included in the external skin treatment composition as a stabilizer, mention may be made of butyl hydroxytoluene (BHT), butyl hydroxyanisole (BHA),  $\alpha,\beta,\gamma,\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate, a fatty acid ester of vitamin C and sorbic acid.

An amount thereof to be formulated in accordance with the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. In order to maintain the effects of the invention for a long time, the formulation amount is preferably 0.03% by weight. The upper limit of the formulation amount depends on the form of the external skin treatment composition and the formulation amount can be optionally selected. Thus, although the upper limit cannot be set, in view of the property of the external skin treatment composition, it is preferably 10% by weight or less.

As ethylenediaminetetraacetate used in the present invention, mention may be made of inorganic alkali salts such as sodium salts and potassium salts and organic alkali salts such as ethanolamines salts (mono, di, tri, tetra salts).

The formulation amount thereof is 0.001% by weight or more. The upper limit of the formulation amount cannot be particularly set. However, if an extremely large amount of the same is formulated, the effects of the present invention are not impaired, but crystals can be precipitated to impair the qualities of the external skin treatment composition. Thus the formulation amount is preferably 0.005 to 1% by weight.

As the benzophenone compound used in the present invention, mention may be made of 2,4-dihydroxybenzophenone (hereinafter referred to as benzophenone-1), 2,2',4,4'-tetrahydroxybenzophenone (hereinafter referred to as benzophenone-2), 2-hydroxy-4-methoxybenzophenone (hereinafter referred to as benzophenone-3), 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid (hereinafter referred to as benzophenone-4), sodium 2-hydroxy-4-methoxybenzophenone-5-sulfonate (hereinafter referred to as benzophenone-5), 2,2'-dihydroxy-4,4'-dimethoxybenzophenone (hereinafter referred to as benzophenone-6), 2-hydroxy-5-chlorobenzophenone (hereinafter referred to as benzophenone-7), 2,2'-dihydroxy-4-methoxybenzophenone (hereinafter referred to as benzophenone-8), disodium 2,2'-dihydroxy-4,4'-dimethoxybenzophenone-5,5'-sulfonate (hereinafter referred to as benzophenone-9), 2-hydroxy-4-methoxy-4'-methoxybenzophenone (hereinafter referred to as benzophenone-10) and 2-hydroxy-4-octyloxybenzophenone (hereinafter referred to as benzophenone-12).

The formulation amount thereof to the external skin treatment composition of the present invention is 0.001% by weight or more. The upper limit of the formulation amount cannot be particularly set. However, if an extremely large amount of the same is formulated, the effects of the present invention are not impaired, but crystals can be precipitated to impair the qualities of the external skin treatment composition. Thus the formulation amount is preferably 0.01 to 10% by weight.

In the seventh embodiment of the present invention, as a stabilizer, are formulated

(A) at least one oil-soluble antioxidant selected from a group consisting of butyl hydroxytoluene (BHT), butyl hydroxyanisole (BHA),  $\alpha,\beta,\gamma,\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate and a fatty acid ester of vitamin C,

(B) at least one compound selected from the group consisting of ascorbic acid, ascorbic acid salts, isoascorbic acid, isoascorbic acid salts, sorbic acid and sorbic acid salts, and

(C) at least one benzophenone compound.

As oil-soluble antioxidants according to the present invention, mention may be made of BHT, BHA,  $\alpha,\beta,\gamma,\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate and a fatty acid ester of vitamin C.

An amount thereof to be formulated in accordance with the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. In order to maintain the effects of the invention for a long time, the formulation amount is preferably 0.03% by weight. The upper limit of the formulation depends on the forms of the external skin treatment composition and the formulation can be optionally made. Thus, although the upper limit cannot be set, in view of the property of the external skin treatment composition, it is preferably 10% by weight.

As ascorbic acid (another name: vitamin C), isoascorbic acid (another name: erythorbic acid), sorbic acid and salts thereof, mention may be made of inorganic alkali salts such as sodium salts and potassium salts thereof as well as organic alkali salts such as ethanolamines salts and basic amino acids thereof. Particularly, ascorbic acid, sodium ascorbate, isoascorbic acid (another name: erythorbic acid), sodium isoascorbate (another name: sodium erythorbate), sorbic acid, sodium sorbate and potassium sorbate are

preferably used.

In a system where each acid and a basic substance are co-utilized, a salt also can be formed.

An amount thereof to be formulated in accordance with the present invention is preferably 0.001% by weight or more. The upper limit of the formulation amount cannot particularly be set. However, if an extremely large amount of the same is formulated, the effects of the present invention are not impaired, but crystals can be precipitated to impair the qualities of the external skin treatment composition. Thus the formulation amount is preferably 10% by weight or less.

As the benzophenone compound used in the present invention, mention may be made of 2,4-dihydroxybenzophenone (hereinafter referred to as benzophenone-1), 2,2',4,4'-tetrahydroxybenzophenone (hereinafter referred to as benzophenone-2), 2-hydroxy-4-methoxybenzophenone (hereinafter referred to as benzophenone-3), 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid (hereinafter referred to as benzophenone-4), sodium 2-hydroxy-4-methoxybenzophenone-5-sulfonate (hereinafter referred to as benzophenone-5), 2,2'-dihydroxy-4,4'-dimethoxybenzophenone (hereinafter referred to as benzophenone-6), 2-hydroxy-5-chlorobenzophenone (hereinafter referred to as benzophenone-7), 2,2'-dihydroxy-4-methoxybenzophenone (hereinafter referred to as benzophenone-8), disodium 2,2'-dihydroxy-4,4'-dimethoxybenzophenone-5,5'-sulfonate (hereinafter referred to as benzophenone-9), 2-hydroxy-4-methoxy-4'-methylbenzophenone (hereinafter referred to as benzophenone-10) and 2-hydroxy-4-octyloxybenzophenone (hereinafter referred to as benzophenone-12).

The formulation amount thereof to the external skin treatment composition of the present invention is 0.001% by weight or more. The upper limit of the formulation amount cannot be particularly set. However, if an extremely large amount of the same is formulated, the effects of the present invention are not impaired, but crystals can be precipitated to impair the qualities of the external skin treatment composition. Thus the formulation amount is preferably 10% by weight.

The cyclodextrin (CD) used in the present invention is cyclic oligosaccharides such as CD having the structure of  $\alpha$ ,  $\beta$  or  $\gamma$  due to the difference in glucose number ( $\alpha$ -CD,  $\beta$ -CD,  $\gamma$ -CD); those to which a lower alkyl group is introduced, i.e., methyl CD (M-CD), ethyl CD (E-CD); hydroxyalkylated compounds, i.e., hydroxymethyl CD (HM-CD), hydroxyethyl CD (HE-CD), hydroxypropyl CD (HP-CD), hydroxybutyl CD (HB-CD).

Among these,  $\alpha$ -CD and  $\gamma$ -CD have good solubility in water, but if they are produced according to a starch decomposition method, the yield of the product is low and therefore, this method is insufficient in view of the cost.  $\beta$ -CD is advantageous from the viewpoint of cost, but the solubility thereof is somewhat insufficient. In each case, if individual properties are well known and a compound is utilized on the basis of these well-known properties, the effects of the present invention can be sufficiently obtained.

In view of the frequent utilization thereof for external skin treatment compositions, due to their good solubility and low cost, methylated CD and hydroxyalkylated CD are preferable, particularly, methyl- $\beta$ -CD, hydroxyalkyl- $\beta$ -CD are the most preferable.

The formulation amount of each CD to the external skin treatment composition of the present invention is 0.01% by weight or more. The upper limit of the formulation amount cannot be particularly limited by the effects of the present invention. However, if an extremely large amount of the same is formulated, the effects of the present invention are not impaired, but crystals can be precipitated to impair the qualities of the external skin treatment composition. Thus, the formulation amount of  $\alpha$ -CD and  $\gamma$ -CD is preferably 10% by weight or less. While, regarding  $\beta$ -CD, 1% by weight or less and regarding lower alkylated CD, hydroxyalkylated CD, the amount is 30% by weight or less.

As oil-soluble antioxidants formulated into the external skin treatment composition according to the present invention, mention may be made of nordihydroguaiaretin, BHT, BHA,  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ -tocopherols, propyl gallate, a fatty acid ester of vitamin C and sorbic acid. Among these, BHT, BHA,  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ -tocopherols are preferably used.

The formulation amount thereof used in the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. In order to maintain the effects of the invention for a long time, the formulation amount is preferably 0.03% by weight. The upper limit of the formulation depends on the form of the external skin treatment composition and the formulation can be optionally made. Thus, although the upper limit cannot be set, in view of the property of the external skin treatment composition, the antioxidant is preferably formulated in the amount of 1% by weight.

Examples of the ultraviolet absorber used in the present invention include benzophenone compounds represented by 2-hydroxy-4-methoxybenzophenone; cinnamic acid compounds represented by octylmethoxycinnamate, mono/di(methoxycinnamyl)-mono/dioctylglyceride; salicylic compounds represented by octylsalicylate; benzoic acid compounds represented by paraaminooctylbenzoate; dibenzoylmethane compounds represented by 4-t-butyl-4'-methoxybenzoylmethane. Benzophenone compounds, cinnamic acid

compounds and dibenzoylmethane compounds are preferably used.

The formulation amount thereof used in the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. In order to maintain the effects of the invention for a long time, the formulation amount is preferably 0.03% by weight. The upper limit of the formulation depends on the form of the external skin treatment composition and the formulation can be optionally made. Thus, although the upper limit cannot be set, in view of the property of the external skin treatment composition, it is preferably 1% by weight.

A method for making antioxidants and ultraviolet absorbers to be included in the above-described CDs generally comprises the step of adding an antioxidant and an ultraviolet absorber to an aqueous solution of CDs (the concentration is 20 to 60% by weight) in an amount of 0.01 to 0.2 part on the basis of the amount of CD, then stirring the resulting mixture (50 to 3000 rpm) at a temperature of 20 to 60°C, whereby the inclusion compound can be obtained. It takes about 2 to 12 hours to obtain the same. The inclusion compound thus obtained is in a solubilized or emulsified state in an aqueous solution and can be used as it is as an external skin treatment composition. Alternatively, this solution can be lyophilized or spray-dried to form a powder.

Further, it is also possible to separately formulate CDs, an antioxidant and an ultraviolet absorber into an external skin treatment composition and to effect the inclusion of these compounds together therein.

In the ninth embodiment of the present invention, as butanediols to be formulated as a stabilizer, mention may be made of 1,2-butanediol, 1,3-butanediol, 1,4-butanediol.

One or more kinds thereof are included in accordance with the present invention. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.01% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, qualities as external skin treatment compositions sometimes can be impaired. Thus the caution should be taken not to impair the qualities of the composition. The formulation amount is particularly preferably 0.1 to 40% by weight.

Examples of oil-soluble antioxidants to be formulated in accordance with the present invention include butyl hydroxytoluene (hereinafter, abbreviated as BHT), butyl hydroxyanisole (hereinafter, abbreviated as BHA),  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate and a fatty acid ester of vitamin C.

The formulation amount thereof is preferably 0.001% by weight or more, more preferably 0.005% by weight or more. In order to maintain the effects of the invention for a long time, the formulation amount is preferably 0.01% by weight or more. Although the upper limit of the formulation amount cannot be particularly set in view of the effects of the present invention, if an extremely large amount of the same is formulated, crystals can be precipitated so that the qualities as the external skin treatment composition sometimes can be impaired. Thus, caution should be taken so as not to impair the qualities of the composition. A preferable formulation amount is 10% by weight.

In the tenth embodiment of the present invention, as the water-soluble benzophenone compound used as a stabilizer, mention may be made of 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid (hereinafter referred to as benzophenone-4) and the salt thereof, sodium 2-hydroxy-4-methoxybenzophenone-5-sulfonate (hereinafter referred to as benzophenone-5) and disodium 2,2'-dihydroxy-4,4'-dimethoxybenzophenone-5,5'-disulfonate (hereinafter referred to as benzophenone-9).

The formulation amount thereof to the external skin treatment composition of the present invention is preferably 0.001% by weight or more, particularly preferably 0.01% by weight or more. The upper limit of the formulation amount cannot be particularly set. However, if an extremely large amount of the same is formulated, the effects of the present invention are not impaired, but crystals can be precipitated to impair the qualities of the external skin treatment composition. Thus the formulation amount is preferably 5% by weight or less.

In the eleventh embodiment of the present invention, as a basic amino acid and the salt thereof to be formulated as a stabilizer, mention may be made of arginine, lysine, hydroxylysine, ornithine, and the hydrochloride, acetate, aspartate, pyrrolidone carboxylate thereof.

In addition to these, a basic amino acid and other acidic substances are co-utilized in the external skin treatment composition and a salt can be formed in situ.

One or more kinds of these compounds are formulated into the composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is required to be 0.001% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, qualities as external skin treatment compositions sometimes can be impaired, for example, by precipitation of crystals. Thus, caution should be taken not to impair the qualities of the composition. The formulation amount is preferably

0.01 to 5% by weight.

The pH of the system is preferably 6 or more, more preferably 7 or more.

In the twelfth embodiment of the present invention, as an acidic amino acid and the salt thereof to be formulated as a stabilizer, mention may be made of acidic amino acids such as aspartic acid and glutamic acid, and inorganic alkali (sodium and potassium) salts thereof as well as organic alkali (ethanolamine and basic amino acids) salts thereof. Further, pyrrolidone carboxylic acid and the salt thereof also can be applied.

One or two or more kinds thereof are included in the present composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, the formulation amount exceeds individual solubility to possibly cause the precipitation of crystals so that qualities as external skin treatment compositions sometimes can be impaired. Thus, caution should be taken not to impair the qualities of the composition. The formulation amount is preferably 10% by weight or less.

In the thirteenth embodiment of the present invention, a polar oil used as a stabilizer is selected from a group consisting of pentaerythritol fatty acid ester preferably having 6 to 12 carbon atoms and trimethylolpropane fatty acid ester preferably having 6 to 12 carbon atoms. Examples thereof include pentaerythritol-tetra(2-ethylhexanoate), pentaerythritol-tetracaprate, trimethylolpropane-tri(2-ethylhexanoate) and trimethylolpropane-tricaprate.

The amount thereof to be formulated in accordance with the present invention cannot be particularly limited because of the wide variety of utilization forms. However, if an extremely small amount of an oil is used, it cannot solubilize vitamin A or an oil-soluble antioxidant so that the effects of the present invention cannot be exhibited. Accordingly, an oil is desirably used in an amount over the total amount of vitamin A and an oil-soluble antioxidant to be formulated in the external skin treatment composition. The oil is preferably used in an amount of 0.002% by weight or more, more preferably 0.1% by weight or more. The upper limit of the formulation amount of the oil cannot be particularly set because of the wide variety of utilization forms. However, the upper limit can be determined by subtracting the sum of an oil-soluble antioxidant and vitamin A from the total amount of the external skin treatment composition.

Examples of oil-soluble antioxidants to be formulated into the external skin treatment composition in accordance with the present invention include BHT, BHA,  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate, a fatty acid ester of vitamin C and sorbic acid.

The formulation amount thereof used in the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. In order to maintain the effects of the invention for a long time the formulation amount is preferably 0.03% by weight.

The upper limit of the formulation depends on the forms of the external skin treatment composition and the formulation can be optionally determined. Thus, although the upper limit cannot be set, in view of the property of the external skin treatment composition, it is preferably 10% by weight.

In the fourteenth embodiment of the present invention, as a water-swellaible clay mineral to be formulated as a stabilizer, mention may be made of, generally, a kind of colloidal water-containing aluminumsilicate. Specific examples thereof include natural or synthetic smectite such as montmorillonite, bidelite, nontronite, saponite, hectolite. As the commercially available products, mention may be made of Kunipia, Smectone (both are available from Kunimine Kogyo K.K.), Vegum (available from Vanderbilt K.K.), Laponite (available from Lapolt K.K.), Fluorotetrasilicon modified mica (available from Topee Kogyo K.K.). Further, synthetic mica known as sodium silicic mica and sodium or lithium teniolite also can be used.

The formulation amount thereof in the external skin treatment composition of the present invention is 0.01% by weight or more, preferably 0.1% or more. The upper limit of the formulation amount cannot be particularly set in view of the effects of the present invention. However, if an extremely large amount of the same is formulated, gelatin may be produced thus deteriorating the qualities of the external skin treatment composition. Thus, caution should be taken not to deteriorate the qualities of the composition. The formulation amount is preferably 50% by weight or less.

Examples of an antioxidant to be formulated in accordance with the present invention include butyl hydroxytoluene (hereinafter abbreviated as BHT), butyl hydroxyanisole (hereinafter abbreviated as BHA), nordihydroguaiaretin,  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ -tocopherols, propyl gallate, vitamin C (ascorbic acid), erythorbic acid (isascorbic acid), erythorbate, vitamin C fatty acid ester, sorbic acid and sorbic acid salt.

The formulation amount thereof used in the present invention is preferably 0.001% by weight or more, more preferably 0.01% by weight or more. In order to maintain the effects of the invention for a long time, the formulation amount is preferably 0.03% by weight.

The upper limit of the formulation amount depends on the forms of the external skin treatment composition and the formulation can be optionally determined. Thus, although the upper limit cannot be set, in view of the property of the external skin treatment composition, it is preferably 10% by weight.

Examples of the ultraviolet absorber used in the present invention include benzophenone compounds represented by 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid and 2,2'-dihydroxy-4,4'-dimethoxybenzophenone; cinnamic acid compounds represented by octylmethoxycinnamate, mono bis(methoxycinnamyl)-mono dioctylglyceride; salicylic compounds represented by octylsalicylate; benzoic compounds represented by paraaminooctylbenzoate; benzoylmethane compounds represented by 4-*t*-octyl-4'-methoxybenzoylmethane.

One or more kinds thereof are formulated in the present composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is preferably 0.001% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, qualities as external skin treatment compositions can sometimes be impaired. Thus, caution should be taken not to impair the qualities of the composition. The formulation amount is preferably 10% by weight or less.

As a chelating agent used in the present invention, mention may be made of inorganic alkali salts such as sodium salts and potassium salts of ethylenediaminetetraacetate, organic alkali salts such as ethanol amines salts of ethylenediaminetetraacetate (mono, di, tri and tetra salts), citric acid and inorganic alkali salts such as sodium and potassium salts of citric acid, organic alkali salts such as ethanol amine salts and basic amino acid salts of citric acid (mono, di, tri and tetra salts). Further, metaphosphoric acid salts or polyphosphoric acid salts can be used.

One or two or more kinds thereof are included in the present composition. The formulation amount thereof for the purpose of exhibiting the effects of the present invention is required to be 0.001% by weight or more. Further, even if an excess amount of the same is formulated, the effects of the present invention are not impaired. However, if an extremely large amount of the same is formulated, crystals can be precipitated so that the qualities as external skin treatment compositions can sometimes be impaired. Thus, caution should be taken not to impair the qualities of the composition. The formulation amount is preferably 1% by weight or less.

In addition to the above-described essential components, the external skin treatment composition according to the present invention can optionally contain a conventional base material of the external skin treatment composition usually used in cosmetics and quasi-drugs and other conventional components such as humectant, surfactant, preservative, water, alcohol, thickener, oil, drug, perfume, colorant, and ultraviolet absorber in an amount which does not deteriorate the effects of the present invention. The composition can be converted to liquid, gel, paste, cream, powder and solid form.

### EXAMPLE

The present invention will be further described in more detail, by, but by no means limited to, the following Examples.

#### Production method and temperature test method of Examples 1-1, 1-2 and Comparative Examples 1-1, 1-2

Each oil component is completely dissolved at 60°C, and then has added thereto a solution of POE(10) oleyl ether, edetic acid salt, ethanol and dipropylene glycol dissolved in purified water, followed by cooling the resulting solution to 40°C. Thereafter, vitamin A is completely dissolved therein, and the solution is sealed in a brown glass sample tube. The tube is further wrapped with aluminum foil to completely cut light and is stored in a constant temperature bath at 40°C.



Table 1-1

Cosmetic oil formulation and vitamin A quantitative determination results (% by weight)			
	Example 1-1	Example 1-2	Comp. Example 1-1
Vitamin A	0.01	0.02	0.01
Disodium edetate	0.001	0.005	-
Hyaluronic acid	0.001	0.001	-
Purified water	0.1	0.2	-
Glycerol tri 2-ethylhexanoate triglyceride	balance	balance	balance
Isopropyl myristate	10	35	10
Squalane	15	15	15
Dipropylene glycol	15	15	15
Ethanol	8	8	8
POE(10) oleyl ether	2	2	2
Vitamin A quantitative determination value			
Immediately after preparation (%)	100	100	100
After two weeks at 40 °C (%)	93	98	56

In Examples 1-1 and 1-2, the stability of vitamin A is improved as compared with Comparative Example 1-1. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol as a solvent, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\% \cdot 1\text{ cm}) = 1835$  was used.

Table 1-2

Emulsion formulation and vitamin A quantitative determination results (% by weight)					
	Example 1-3	Example 1-4	Comp. Ex. 1-3	Comp. Ex. 1-3	
35					
	Vitamin A	0.03	0.001	0.03	0.001
	Disodium edetate	0.01	-	-	-
	Trisodium citrate	0.02	0.02	-	-
	Cetylisoocitrate	10	7	10	7
40	Glycerol 2-ethylhexanoate	2	4	2	4
	Squalane	2	2	2	2
	Cetyl alcohol	2	2	2	2
	Vaseline	1	1	1	1
	Glyceryl monostearate	1.5	1.5	1.5	1.5
45	POE(60) hardened castor oil	1.3	1.3	1.3	1.3
	Carboxyvinyl polymer	0.2	0.3	0.2	0.3
	Gum xanthane	0.05	0.1	-	-
	Caustic potash	0.06	0.08	0.06	0.08
50	Glycerol	10	10	10	10
	Propylene glycol	3	3	3	3
	Ethyl paraben	0.2	0.2	0.2	0.2
	Purified water	To total amount 100			
Vitamin A quantitative determination value					
55					
	Immediately after preparation (%)	100	100	100	100
	After one month at 40 °C (%)	95	97	31	38

In Examples 1-3 and 1-4, the stability of vitamin A is improved as compared with Comparative Example. This is the effect according to the present invention.

Table 1-3

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Cosmetic lotion and vitamin A quantitative determination results (% by weight)				
	Example 1-5	Example 1-6	Example 1-7	Comp. Ex. 1-4
Disodium edetate	0.5	-	0.05	-
Tetrapotassium edetate	-	0.3	0.05	-
Sodium hyaluronate	0.1	0.05	-	-
Sodium chondroitin sulfate	-	-	0.2	-
Ethanol	5.0	5.0	5.0	5.0
Methyl paraben	0.1	0.1	0.1	0.1
Vitamin A	0.0001	0.0001	0.0001	0.0001
Octadodecanol	0.001	0.001	0.001	0.001
POE(60) hardened castor oil	0.4	0.4	0.4	0.4
Lactic acid	0.01	0.01	0.01	0.01
Sodium lactate	0.1	0.1	0.1	0.1
Glycerol	2.0	2.0	2.0	2.0
Purified water	To total amount 100			
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After two weeks at 40 °C (%)	95	93	91	49

In Examples 1-5, 1-6, and 1-7, the stability of vitamin A is improved as compared with Comparative Example. This is the effect according to the present invention.

#### Example 1-8: Cosmetic lotion

	(% by weight)
Oleyl alcohol	0.005
Vitamin A	0.0001
POE(50) oleyl ether	0.7
Trisodium edetate	1
Lactic acid	0.01
Sodium lactate	0.09
Sodium chondroitin sulfate	0.1
Ethanol	8
Glycerol	2
Methyl paraben	0.2
Purified water	To total amount 100

Example 1-9: Cream

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	(% by weight)
Squalane	15
Glycerol tri 2-ethylhexanoate	8
Isopropylmyristate	7
Vitamin A	0.3
Vaseline	2
Butyl paraben	0.1
Propyl paraben	0.1
Glycerol monooleate	3
Diglyceroldiisostearate	2
PEG400 dioleate	1
Glycerol	10
Cellulose powder	1
Dipropylene glycol	5
Disodium edetate	0.01
Triethanolamine	0.02
Purified water	To total amount 100

25 Example 1-10: Olescence

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	(% by weight)
Glycerol tri 2-ethylhexanoate	50
Octyldodecanol	20
Squalane	10
Vitamin A	1
Dibutylphthalate	9
Ethyl alcohol	9.989
Cellulose powder	0.01
Sodium edetate	0.001

40 Example 1-11: Oil gel

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	(% by weight)
Glycerol tri 2-ethylhexanoate	60
POE(20) octyldodecylether	16
Vitamin A	0.1
Glycerol	16
Sodium hyaluronate	0.01
Disodium edetate	0.05
Purified water	To total amount 100

Example 1-12: Cream

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	(% by weight)
Cetostearyl alcohol	3.5
Squalane	30.0
Beeswax	3.0
Reduced lanolin	5.0
Ethyl paraben	0.3
POE(50) Oleyl alcohol ether	2.0
Glycerol monostearate	2.0
Diethanol amine edetate	0.01
Perfume	0.03
Vitamin A	0.0001
Dermatan sulfate	0.1
Glycerol	15.0
Purified water	balance

Example 1-13: Pack

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	(% by weight)
Gum xanthane	1.0
Polyvinyl alcohol	10.0
Propylene glycol	7.0
Ethanol	10.0
Vitamin A	0.01
Monosodium edetate	0.1
Methyl paraben	0.05
POE(60) hydrogenated castor oil	0.2
Perfume	0.05
Purified water	balance

Example 1-14: Compact face powder

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	(% by weight)
Vitamin A	0.0005
Talc	85.4
Stearic acid	2.5
Squalane	3.5
Sorbitansesquioleate	1.8
Triethanolamine	1.2
Quinsseed	0.001
Salt of edetic acid	0.001
Pigment	q.s.
Perfume	q.s.

Example 1-15: Lipstick

	(% by weight)
Vitamin A	0.00001
Microcrystalline wax	3.0
Bees wax	3.0
Ceresin wax	5.0
Liquid paraffin	19.0
Squalane	20.0
Carnauba wax	3.0
Candelilla wax	3.0
Gum arabic	0.01
Monosodium salt of edetic acid	0.01
Color controlling colorant	7.0
Dibutylhydroxytoluene	0.05
Perfume	q.s.
Lanolin	balance

Example 1-16: Emulsion

	(% by weight)
Vitamin A	1.0
Hyaluronic acid	0.1
Tetraethanol amine edetate	1.0
Ethanol	2.0
Glycerol	10.0
Propylene glycol	3.0
Carboxyvinyl polymer	0.3
KOH	0.1
Methyl paraben	0.1
Cetanol	2.5
Vaseline	2.0
Squalane	10.0
Isopropyl myristate	5.0
Glycerylmonostearate	2.0
POE(25) Cetyl ether	2.0
Purified water	balance

Example 1-17: Emulsion

	(% by weight)
Vitamin A	0.3
Chondroitin sulfate	0.01
Trisodium citrate	0.1
Ethanol	5.0
Glycerol	5.0
Propylene glycol	5.0
Carboxyvinyl polymer	0.2
KOH	0.06
Methyl paraben	0.2
POE(60) Hydrogenated castor oil	1.0
Squalane	3.0
Isopropyl myristate	3.0
Purified water	balance

The external skin treatment compositions of Examples 1-8 to 1-17 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention, by formulating one or more chelating agents and polysaccharides such as hyaluronic acid and chondroitin sulfate, the stability of vitamin A can be extremely improved.

Example 2-1 to 2-3 and Comparative Example 2-1 to 2-2

Table 2-1

Vitamin A stability determination results in various oils (% by weight)					
	Example 2-1	Example 2-2	Example 2-3	Comp. Example 2-1	Comp. Example 2-2
Olive oil (IV = 75)	99	-	-	-	-
Cotton seed oil (IV = 95)	-	99	-	-	-
Evening primrose Oil (IV = 190)	-	-	50	-	-
Squalane (IV = 1)	-	-	49	49	99
Palm oil (IV = 12)	-	-	-	50	-
Vitamin A	1	1	1	1	1
Quantitative determination value of vitamin A					
Immediately after preparation (%)	100	100	100	100	100
After ten days at 50 °C (%)	93	98	97	58	39

In Examples 2-1, 2-2 and 2-3, the stability of vitamin A is improved as compared with Comparative Example. This is the effect according to the present invention.

Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol as a solvent, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

Example 2-4: Cream

		(% by weight)
A.	Cetanol	3
	Glycerylmonostearate	2
	POE(25) Cetyl ether	1
	Stearic acid	3
	Vaseline	3
	Olive oil (IV = 80)	3
	Cotton seed oil (IV = 100)	1
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	Propylene glycol	3
	Potassium hydroxide	0.2
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70 °C. then A is added to B. the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream.

Example 2-5: Lipstick

	(% by weight)
Solid paraffin	8
Carnauba wax	4
Candelilla wax	4
Microcrystalline wax	6
Hydrogenated lanolin	15
Castor oil (IV = 85)	46.7
Oyster oil (IV = 160)	5
Evening primrose oil (IV = 190)	3
Vitamin A	1
BHT	0.3
Mixed colorant (red type)	7
Perfume	q.s.

Each of the above-described starting materials is thermally melted at 80 °C. and thereafter, the molten product is poured into a given container to obtain a lipstick.

Example 2-6: Cosmetic lotion

	(% by weight)
Vitamin A	0.0001
Oleyl alcohol (IV = 80)	0.01
$\alpha$ -tocopherol	0.005
POE(20) Octyldodecanol	0.8
Ethanol	8
Propylene glycol	3
Glycerol	1
Methyl paraben	0.15
Lactic acid	0.01
Sodium lactate	0.09
Purified water	To total amount 100

Example 2-7: Eye wrinkle oil

	(% by weight)
Macadamia nut oil (IV = 75)	40
Glycerol tri $\gamma$ -undecenate (IV = 198)	1
Glycerol tri 2-ethylhexanoate	25
Sunflower oil (IV = 130)	20
Squalane	10
PEG600 dioleate	2.8
$\delta$ -tocopherol	1
Vitamin A	0.2

Example 2-8: Night cream

	(% by weight)
Olive oil (IV = 80)	8
Evening primrose oil (IV = 185)	2
Squalane	20
PEG400 diisostearate	1
Diglycerol dioleate	1
Butyl paraben	0.15
Glycerol monooleate	2
Vitamin A	0.25
Glycerol	10
Magnesium sulfate	0.2
Purified water	To total amount 100

The external skin treatment compositions of Examples 2-4 to 2-8 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention, by formulating an oil having an iodine value of 70 or more, the stability of vitamin A can be extremely improved.



## Example 3-1 to 3-3 and Comparative Example 3-1 to 3-2

Table 3-1

Vitamin A stability determination results in various bases (% by weight)					
	Example 3-1	Example 3-2	Example 3-3	Comp. Example 3-1	Comp. Example 3-2
PEG400	99.9	-	-	-	-
PEG1500	-	99.9	-	-	-
PPG1200	-	-	50	-	-
Propylene glycol	-	-	49.9	29.9	-
Squalane	-	-	-	70	99.9
Vitamin A	0.1	0.1	0.1	0.1	0.1
Quantitative determination result of vitamin A					
Immediately after preparation (%)	100	100	100	100	100
After five days at 50 °C (%)	92	93	90	58	39

In Examples 3-1, 3-2 and 3-3, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

## Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol as a solvent, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

## Example 3-4: Cream

		(% by weight)
A.	Cetanol	3
	Glyceryl monostearate	2
	POE(25) Cetyl ether	1
	Stearic acid	3
	Vaseline	3
	Isopropyl myristate	5
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	PEG1500	3
	Glycerol	9
	Potassium hydroxide	0.2
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70 °C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream.

Example 3-5: Lipstick

	(% by weight)
Solid paraffin	8
Carnauba wax	2
Candelilla wax	4
Microcrystalline wax	6
Hydrogenated lanolin	15
Isopropyl myristate	To total amount 100
Glyceryldiisostearate	30
PPG3000	15
Vitamin A	1
BHT	0.3
Mixed colorant (red type)	7
Perfume	q.s.

Each of the above-described starting materials is thermally melted at 80 °C. and thereafter, the molten product is poured into a given container to obtain a lipstick.

Example 3-6: Cosmetic lotion

	(% by weight)
Vitamin A	0.0001
Oleyl alcohol	0.001
$\alpha$ -tocopherol	0.005
POE(20) Octyldecylalcohol	0.8
Ethanol	8
PEG300	3
PEG1500	1
Methyl paraben	0.15
Lactic acid	0.03
Sodium lactate	0.07
Purified water	To total amount 100

Example 3-7: Eye wrinkle oil

	(% by weight)
Olive oil	40
Glycerol tri 2-ethylhexanoate	26
Squalane	30
PPG4000	2
PEG20000	0.9
$\delta$ -tocopherol	1
Vitamin A	0.1

Example 3-8: Beauty paste

	(% by weight)
PEG300	30
PEG1500	40
PEG4000	10
Vitamin A	0.3
Isopropyl myristate	5
POE(25) Cetyl ether	2
Stearic acid	5
Purified water	To total amount 100

Example 3-9: Night cream

	(% by weight)
Squalane	15
Isopropyl myristate	5
Silicon dioxide	3
Vaseline	6
Glyceryl monoisostearate	2
POE(7) Hydrogenated castor oil	1.5
Propyl paraben	0.2
Vitamin A	0.4
PEG6000	3
PEG400	3
Glycerol	17
Purified water	To total amount 100

The external skin treatment compositions of Examples 3-4 to 3-9 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention, by formulating polyethylene glycol and/or propylene glycol, the stability of vitamin A can be extremely improved.

## Examples 4-1 to 4-3 and Comparative Example 4-1

Table 4-1

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Vitamin A stability determination results in emulsion (% by weight)				
	Example 4-1	Example 4-2	Example 4-3	Comp. Example 4-1
Purified water	To total amount 100			
Glycerol	10	10	10	10
Carboxyvinyl polymer	0.2	0.2	0.2	0.2
Caustic potash	0.03	0.03	0.06	0.06
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Cetyl alcohol	2	2	2	2
Vaseline	3	3	3	3
Squalane	5	5	5	5
Isocrotyl myristate	4	4	4	4
Glyceryl monostearate	1.5	1.5	1.5	1.5
POE(60) Hydrogenated castor oil	2	2	2	2
Trisodium citrate	0.08	-	0.04	-
Sodium lactate	-	0.09	0.05	-
Vitamin A	0.3	0.3	0.3	0.3
Quantitative determination value of vitamin A				
Immediately after preparation (%)	100	100	100	100
After two weeks at 40 °C (%)	98	93	95	75

In Examples 4-1, 4-2 and 4-3, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol as a solvent, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

Example 4-4: Cream

		(% by weight)
A.	Cetanol	3
	Glycerylmonostearate	2
	POE(25) Cetyl ether	1
	Stearic acid	3
	Vaseline	3
	Olive oil	3
	Isopropyl palmitate	1
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	Propylene glycol	3
	Potassium hydroxide	0.2
	Trisodium citrate	1
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70°C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream.

Example 4-5: Beauty essence

	(% by weight)
Carboxyvinyl polymer	0.4
Glycerol	5
Propylene glycol	5
Sodium lactate	0.05
Triethanolamine	3.8
POE(60) Hydrogenated castor oil	0.5
Vitamin A	0.1
Squalane	1
$\alpha$ -tocopherol	0.05
Methyl paraben	0.2
Ethyl alcohol	6
Purified water	To total amount 100

Example 4-6: Cosmetic lotion

	(% by weight)
Glycerol	2
Ethanol	7
POE(50) Oleyl ether	0.5
Oleyl alcohol	0.002
Vitamin A	0.0001
Trisodium citrate	0.1
Methyl paraben	0.1
Purified water	To total amount 100

Example 4-7: Oil gel

	(% by weight)
Vitamin A	1
Glycerol tri 2-ethylhexanoate	40
Olive oil	10
BHT	0.1
BHA	0.05
POE(20) Octyldodecyl ether	16
Glycerol	15
Disodium citrate	0.1
Purified water	To total amount 100

Example 4-8: Night cream

	(% by weight)
Squalane	15
Glycerol tri 2-ethylhexanoate	5
Vaseline	5
Butyl paraben	0.2
Diglycerol diisostearate	2
PEG400 Diisostearate	0.5
Vitamin A	0.1
Glycerol	10
Trisodium citrate	0.3
Sodium lactate	0.1
Lactic acid	0.1
Purified water	To total amount 100

The external skin treatment compositions of Examples 4-4 to 4-8 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention, by formulating hydroxycarboxylate, the stability of vitamin A can be extremely improved.

Examples 5-1 to 5-3 and Comparative Example 5-1

Table 5-1

Vitamin A stability determination results in emulsion (% by weight)				
	Example 5-1	Example 5-2	Example 5-3	Comp. Example 5-1
Purified water	To total amount 100			
Glycerol	10	10	10	10
Carboxyvinyl polymer	0.2	0.2	0.2	0.2
Caustic potash	0.06	0.06	0.06	0.06
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Cetyl alcohol	2	2	2	2
Butyl alcohol	1	1	1	1
Vaseline	3	3	3	3
Squalane	5	5	5	5
Isopropyl myristate	4	4	4	4
Glyceryl monostearate	1.5	1.5	1.5	1.5
POE(60) Hydrogenated castor oil	2	2	2	2
BHT	0.03	0.03	0.03	0.03
Glycine	1	-	-	-
Hydroxy proline	1	0.5	0.01	-
Vitamin A	0.3	0.3	0.3	0.3
Quantitative determination result of vitamin A				
Immediately after preparation (%)	100	100	100	100
After two weeks at 40 °C (%)	98	96	88	55

In Examples 5-1, 5-2 and 5-3, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol as a solvent, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

Example 5-4: Cream

		(% by weight)
A.	Cetanol	3
	Glyceryl monostearate	2
	POE(25) Cetyl ether	1
	Stearic acid	3
	Vaseline	3
	Olive oil	3
	Isopropyl myristate	1
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	Propylene glycol	3
	Potassium hydroxide	0.2
	Alanine	5
	Hydroxy proline	5
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70 °C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream.

Example 5-5: Beauty essence

	(% by weight)
Carboxyvinyl polymer	0.4
Glycerol	5
Propylene glycol	5
Alanine	1
Triethanolamine	3.4
POE(60) Hydrogenated castor oil	0.5
Vitamin A	0.1
Squalane	1
$\alpha$ -tocopherol	1
Methyl paraben	0.2
Ethyl alcohol	6
Purified water	To total amount 100



Example 5-6: Cosmetic lotion

	(% by weight)
Glycerol	2
Ethanol	7
POE(50) Oleyl ether	0.5
Oleyl alcohol	0.002
Vitamin A	0.0001
Serine	0.3
Leucine	0.1
Lactic acid	0.02
Sodium lactate	0.07
Methyl paraben	0.1
Purified water	To total amount 100

Example 5-7: Oil gel

	(% by weight)
Vitamin A	1
Glycerol tri 2-ethylhexanoate	40
Olive oil	10
BHT	0.2
BHA	0.05
POE(20) Octyldodecyl ether	16
Glycerol	15
Glycine	0.1
Purified water	To total amount 100

Example 5-8: Night cream

	(% by weight)
Liquid paraffin	15
Glycerol tri 2-ethylhexanoate	7
Vaseline	6
Solid paraffin	2
Diglycerol dioleate	1.5
Triglycerol diisosearate	1.5
Vitamin A	0.1
Propyl paraben	0.2
Propylene glycol	4
Glycerol	15
Glycine	1
Hydroxyproline	1
Purified water	To total amount 100

The external skin treatment compositions of Examples 5-4 to 5-8 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention, by formulating, a neutral amino acid, the stability of vitamin A can be extremely improved.

Example 6-1 to 6-2 and Comparative Example 6-1 to 6-2

Table 6-1

Cosmetic oil formulation and vitamin A quantitative determination results (% by weight)				
	Example 6-1	Example 6-2	Comp. Example 6-1	Comp. Example 6-2
Vitamin A	0.01	0.2	0.01	0.2
BHT	0.005	0.03	0.005	0.03
d1- $\alpha$ -tocopherol	-	0.01	-	0.01
Benzophenone-3	0.05	0.1	-	-
Octylmethoxycinnamate	-	-	0.05	0.1
Disodium edetate	0.001	0.005	-	0.005
Purified water	0.1	0.2	-	0.2
Glycerol tri 2-ethylhexanoate	45	20	45	20
Isopropyl myristate	10	35	10	35
Squalane	24.834	24.455	24.935	24.455
Dipropylene glycol	10	10	10	10
Ethanol	8	8	8	8
POE(10) Oleyl ether	2	2	2	2
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After two months at 40 °C (%)	93	98	68	82

In Examples 6-1 and 6-2, the stability of vitamin A is improved as compared with Comparative Example. This is the effect according to the present invention.

Production method and temperature test method of Examples 6-1, 6-2 and Comparative Examples 6-1, 6-2

BHT, tocopherol, benzophenone and octylmethoxycinnamate are each completely dissolved in oil at 60 °C, then to the resulting solution is added a solution of edetate, ethyl alcohol and dipropylene glycol dissolved in purified water, followed by cooling the resulting solution to 40 °C. Thereafter, vitamin A is completely dissolved therein, and the solution is sealed in a brown glass sample tube. The tube is further wrapped with aluminum foil to completely cut light and is stored in a constant temperature bath at 40 °C.

Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol as a solvent, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

Production method and temperature test method of Examples 6-3, 6-4 and Comparative Examples 6-3, 6-4

BHT, tocopherol and benzophenone-2 are each completely dissolved in oil and a surfactant at 70 °C, and thereafter, immediately before emulsification, vitamin A is completely dissolved therein to form an oil phase.

Glycerol, propylene glycol, carboxyvinyl polymer, caustic potash, trisodium edetate and benzophenone-5 are completely dissolved in purified water. The oil phase is added to the resulting aqueous phase heated to 70 °C, then the mixture obtained is emulsified by a homomixer type emulsifier. Then the resulting product is subjected to a cooling treatment by a heat exchanger to 30 °C to form an emulsion.

The emulsion is filled in a glass bottle having a metal coat applied thereto, tightly sealed and is stored in a constant temperature bath at 40 °C.

Table 6-2

Emulsion formulation and vitamin A quantitative determination results (% by weight)					
	Example 6-3	Example 6-4	Comp. Example 6-3	Comp. Example 6-4	
5					
	Vitamin A	0.3	0.01	0.3	0.01
	BHT	0.05	0.01	0.05	0.01
	$\alpha$ -tocopherol	0.01	0.02	0.01	0.02
	Trisodium edetate	0.02	0.02	0.02	-
10	Benzophenone-2	0.1	0.05	-	0.02
	Benzophenone-5	-	0.05	-	-
	Cetylisooctanoate	10	7	10	7
	Isopropyl myristate	2	4	2	4
15	Squalane	2	2	2	2
	Cetyl alcohol	2	2	2	2
	Vaseline	1	1	1	1
	Glyceryl monostearate	1.5	1.5	1.5	1.5
	POE(60) hydrogenated castor oil	1.3	1.3	1.3	1.3
20	Carboxyvinyl polymer	0.2	0.3	0.2	0.3
	Caustic potash	0.06	0.08	0.06	0.08
	Glycerol	10	10	10	10
	Propylene glycol	3	3	3	3
	Ethyl paraben	0.2	0.2	0.2	0.2
25	Purified water	To total amount 100			
Vitamin A quantitative determination value					
	Immediately after preparation (%)	100	100	100	100
	After one month at 40 °C (%)	97	99	29	22

In Examples 6-3 and 6-4, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol, the quantitative determination was effected. A sample was prepared by removing vitamin A from Examples and Comparative Examples (control) and the absorption at 325 nm was measured, which was used for correcting an absorbance as the absorbance of a base material.

(absorbance of a sample of Example and Comparative Example at 325 nm) - (an absorbance of a control)  
= the absorbance of vitamin A

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

Example 6-5: Cosmetic lotion

	(% by weight)
Oleyl alcohol	0.002
Benzophenone-12	0.001
$\alpha$ -tocopherol	0.001
Vitamin A	0.0001
POE(50) Oleyl ether	0.7
Lactic Acid	0.1
Sodium lactate	0.9
Ethanol	8
Glycerol	2
Methyl paraben	0.2
Trisodium edetate	0.01
Purified water	To total amount 100

Example 6-6: Oil essence

	(% by weight)
Glycerol tri 2-ethylhexanoate	30
Octyldodecanol	20
Squalane	12
BHT	1
$\alpha$ -tocopherol	9
Vitamin A	8
Dioropylene glycol	12.899
Ethyl alcohol	5
Benzophenone	0.1
Disodium edetate	0.001

Example 6-7: Cream

	(% by weight)
Squalane	15
Glycerol tri 2-ethylhexanoate	8
isopropyl myristate	7
BHT	0.05
BHA	0.01
$\alpha$ -tocopherol	0.01
Vitamin A	0.3
Vaseline	2
Butyl paraben	0.1
Propyl paraben	0.1
Glycerol monooleate	3
Diglyceroldiisostearate	2
PEG400 dioleate	1
Glycerol	10
Dipropylene glycol	5
Disodium edetate	0.01
Benzophenone-6	0.1
Benzophenone-4	0.03
Triethanolamine	0.04
Purified water	To total amount 100

Example 6-8: Oil essence

	(% by weight)
Isopropyl myristate	10
Octyldodecanol	20
Squalane	30
BHT	1
$\alpha$ -tocopherol	9
Vitamin A	1
Dibutyl phthalate	9
Ethyl alcohol	9.999
Benzophenone-12	7
Benzophenone-6	3
Sodium edetate	0.001

Example 6-9: Oil gel

	(% by weight)
Glycerol tri 2-ethylhexanoate	60
POE(20) octyldodecyl ether	16
Vitamin A	0.1
Benzophenone-12	0.1
Glycerol	16
Benzophenone-5	0.05
Trisodium edetate	0.02
BHA	0.01
BHT	0.01
Purified water	To total amount 100

The external skin treatment compositions of Examples 6-5 to 6-9 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention, by formulating

(A) one or two or more of oil-soluble antioxidant selected from the group consisting of a, butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha,\beta,\gamma,\delta$ -tocopherol, nordihydroguaiaretin, propyl gallate, a fatty acid ester of vitamin C and sorbic acid.

(B) one or two or more of ethylenediaminetetraacetate and

(C) one or two or more of benzophenone compound, the stability of vitamin A can be extremely improved.

Production method and temperature test method of Examples 7-1, 7-2 and Comparative Examples 7-1, 7-2

BHT, tocopherol, benzophenone and octylmethoxycinnamate are each completely dissolved in oil at 60°C, then to the resulting solution, is added a solution of sorbic acid and dipropylene glycol dissolved in ethyl alcohol, followed by cooling the resulting solution to 40°C. Thereafter, vitamin A is completely dissolved therein, and the solution is sealed in a brown glass sample tube. The tube is further wrapped with aluminum foil to completely cut light and is stored in a constant temperature bath at 40°C.

Table 7-1

Cosmetic oil formulation and vitamin A quantitative determination results (% by weight)				
	Example 7-1	Example 7-2	Comp. Example 7-1	Comp. Example 7-2
Vitamin A	0.01	0.2	0.01	0.2
BHT	0.005	0.03	0.005	0.03
$\alpha$ -tocopherol	-	0.01	-	0.01
Benzophenone-3	0.05	0.1	-	-
Octylmethoxycinnamate	-	-	0.05	0.1
Sorbic acid	0.001	0.005	-	0.005
Glycerol tri 2-ethylhexanoate	45	20	45	20
Isopropyl myristate	10	35	10	35
Squalane	To total amount 100			
Dipropylene glycol	10	10	10	10
Ethanol	8	8	8	8
POE(10) Oleyl ether	2	2	2	2
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After two months at 40 °C (%)	95	96	71	69

#### Quantitative determination method of vitamin A

Japanese Pharmacopoeia (11th revision) In accordance with the second method of vitamin A quantitative determination method, the quantitative determination was effected by an absorbance determination method using isopropanol. In examples 7-1 and 7-2, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Production method and temperature test method of Examples 7-3, 7-4 and Comparative Examples 7-3, 7-4

BHT, tocopherol and benzophenone-2 are each completely dissolved in oil and a surfactant at 70 °C. thereafter, immediately before emulsification, vitamin A is completely dissolved therein to form an oil phase.

Glycerol, propylene glycol, carboxyvinyl polymer, caustic potash, ascorbic acid and benzophenone-5 are completely dissolved in purified water. The oil phase is added to the resulting aqueous phase heated to 70 °C, then the mixture obtained is emulsified by a homomixer type emulsifier. Then the resulting product is subjected to a cooling treatment by a heat exchanger to 30 °C to form an emulsion.

The emulsion is filled in a glass bottle having a metal coat applied thereto, tightly sealed and is stored in a constant temperature bath at 40 °C.

Table 7-2

Emulsion formulation and vitamin A quantitative determination results (% by weight)				
	Example 7-3	Example 7-4	Comp. Example 7-3	Comp. Example 7-4
Vitamin A	0.3	0.01	0.3	0.01
BHT	0.05	0.01	0.05	0.01
$\alpha$ -tocopherol	0.01	0.02	0.01	0.02
Ascorbic acid	0.05	0.05	0.05	-
Benzophenone-2	0.1	0.05	-	0.05
Benzophenone-5	-	0.05	-	-
Cetyl isooctanoate	10	7	10	7
Squalane	5	5	5	5
Cetyl alcohol	2	2	2	2
Vaseline	1	1	1	1
Glyceryl-monostearate	1.5	1.5	1.5	1.5
POE(60) hydrogenated castor oil	1.3	1.3	1.3	1.3
Carboxyvinyl polymer	0.2	0.3	0.2	0.3
Caustic potash	0.06	0.08	0.06	0.08
Glycerol	10	10	10	10
Propylene glycol	3	3	3	3
Ethyl paracen	0.2	0.2	0.2	0.2
Purified water	To total amount 100			
Vitamin A quantitative determination value				
immediately after preparation (%)	100	100	100	100
After two weeks at 40 °C (%)	96	98	47	41

In Examples 7-3 and 7-4, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol, the quantitative determination was effected. A sample was prepared by removing vitamin A from Examples and Comparative Examples (control) and the absorption at 325 nm was measured, which was used for correcting an absorbance as the absorbance of a base material.

(absorbance of a sample of Example and Comparative Example at 325 nm) - (absorbance of a control) = the absorbance of vitamin A

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.



Example 7-5: Cosmetic lotion

	(% by weight)
Oleyl alcohol	0.002
Benzophenone	0.001
$\alpha$ -tocopherol	0.001
Vitamin A	0.0001
POE(50) Oleyl ether	0.7
Lactic acid	0.1
Sodium lactate	0.9
Ethanol	8
Glycerol	2
Methyl paraben	0.2
Sodium erythorbate (Sodium isoascorbate)	0.5
Purified water	To total amount 100

Example 7-6: Oil essence

	(% by weight)
Glycerol tri 2-ethylhexanoate	10
Octyldodecanol	20
Squalane	39
BHT	1
$\alpha$ -tocopherol	9
Vitamin A	1
Dipropylene glycol	12.89
Ethyl alcohol	5
Benzophenone	0.1
Sorbic acid	0.01

Example 7-7: Cream

	(% by weight)
Squalane	15
Glycerol tri 2-ethylhexanoate	8
Isopropyl myristate	7
BHT	0.05
BHA	0.01
$\alpha$ -tocopherol	0.01
Vitamin A	0.3
Vaseline	2
Butyl paraben	0.1
Propyl paraben	0.1
Glycerol monooleate	3
Diglyceroldiisostearate	2
PEG400dioleate	1
Glycerol	10
Dipropyl glycol	5
Sodium ascorbate	0.01
Benzophenone-8	0.1
Benzophenone-4	0.03
Triethanolamine	0.04
Purified water	To total amount: 100

Example 7-8: Beauty essence

	(% by weight)
Glycerol	30
Propylene glycol	10
Olive oil	2
BHT	0.1
$\alpha$ -tocopherol	0.1
Vitamin A	0.1
Ethyl alcohol	4
Ascorbic acid	10
Potassium sorbate	0.1
Gumxanthane	0.8
POE(60) hydrogenated castor oil	0.6
Purified water	To total amount 100

Example 7-9: Oil gel

	(% by weight)
Glycerol tri 2-ethylhexanoate	60
POE(20) octyldodecyl ether	16
Vitamin A	0.1
Benzophenone-12	0.1
Glycerol	16
Erythorbic acid (Isoascorbic acid)	0.05
Benzophenone-5	0.05
BHA	0.01
BHT	0.01
Purified water	To total amount 100

The external skin treatment compositions of Examples 7-5 to 7-9 were excellent in the stability of vitamin A in daily use.

- In the external skin treatment composition of the present invention, by formulating
- (A) at least one oil-soluble antioxidant selected from the group consisting of a butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha,\beta,\gamma,\delta$ -tocopherol, nordihydroguaiaretin, propyl gallate and a fatty acid ester of vitamin C,
- (B) at least one compound selected from the group consisting of ascorbic acid, ascorbic acid salt, isoascorbic acid, isoascorbic acid salt, sorbic acid and sorbic acid salt, and
- (C) at least one benzophenone compound, the stability of vitamin A can be extremely improved.

Examples 8-1 to 8-2 and Comparative Examples 8-1 to 8-2

Table 8-1

Vitamin A stability determination results in emulsion (% by weight)				
	Example 8-1	Example 8-2	Comp. Example 8-1	Comp. Example 8-2
Purified water	To total amount 100			
Glycerol	10	10	10	10
Carboxyvinyl polymer	0.2	0.2	0.2	0.2
Caustic potash	0.06	0.06	0.06	0.06
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Cetyl alcohol	2	2	2	2
Vaseline	3	3	3	3
Squalane	5	5	5	5
Isopropyl myristate	4	4	4	4
Glycerylmonostearate	1.5	1.5	1.5	1.5
POE(60) hydrogenated castor oil	2	2	2	2
HP- $\beta$ -CD	5	5	-	-
BHT	0.05	-	0.05	-
Octylmethoxycinnamate	-	0.05	-	0.05
Vitamin A	0.3	0.3	0.3	0.3
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After two weeks at 40 °C (%)	98	93	65	55

As compared with Examples 8-1, 8-2, and the Comparative Examples, the stability of vitamin A is improved. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol, the quantitative determination was effected. A sample was prepared by removing vitamin A from Example 8-2 and Comparative Example 8-2 (control) and the absorption at 325 nm was measured, which was used for correcting an absorbance as the absorbance of a base material.

(Absorbance of a sample of Example and Comparative Example at 325 nm) - (Absorbance of a control) = Absorbance of vitamin A

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

Table 8-2

Emulsion formulation and vitamin A quantitative determination results (% by weight)					
	Example 8-3	Example 8-4	Comp. Example 8-3	Comp. Example 8-4	
20					
	β-M-CD	1	1	-	-
	α-CD	3	1	-	-
	γ-CD	2	1	-	-
	BHT	0.05	0.01	0.05	0.01
25	α1-α-tocopherol	0.01	0.02	0.01	0.02
	Vitamin A	0.3	0.01	0.3	0.01
	Cetyl isooctanoate	10	7	10	7
	Squalane	5	2	5	2
	Cetyl alcohol	2	2	2	2
30	Vaseline	1	1	1	1
	Glyceryl-monostearate	1.5	1.5	1.5	1.5
	POE(60) hydrogenated castor oil	1.3	1.3	1.3	1.3
	Carboxyvinyl polymer	0.2	0.2	0.2	0.2
	Caustic potash	0.06	0.06	0.06	0.06
35	Glycerol	10	10	10	10
	Propylene glycol	3	3	3	3
	Methyl paraben	0.2	0.2	0.2	0.2
	Purified water	To total amount 100			
40	Vitamin A quantitative determination value				
	Immediately after preparation (%)	100	100	100	100
	After one month at 40 ° C (%)	97	94	60	59

In Examples 8-3 and 8-4, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

Example 8-5: Cosmetic lotion

	(% by weight)
Oleyl alcohol	0.002
$\beta$ -CD	0.01
BHA	0.001
Vitamin A	0.0001
POE(50) Oleyl ether	0.7
Lactic acid	0.01
Sodium lactate	0.09
Ethanol	5
Glycerol	1
Methyl paraben	0.2
Purified water	To total amount 100

Example 8-6: Beauty essence

	(% by weight)
HP- $\beta$ -CD	30
BHT	1
Vitamin A	1
Isopropyl myristate	10
POE(60) hydrogenated castor oil	1
POE(20) sorbitan laurate	1
Carboxyvinyl polymer	0.3
Triethanolamine	2.3
Ethanol	3
Methyl paraben	0.1
Purified water	To total amount 100

Example 8-7: Cream

	(% by weight)
HE- $\beta$ -CD	3
BHT	0.01
2-hydroxy-4-methoxybenzophenone	0.02
Vitamin A	0.3
Glycerol tri-2-ethylhexanoate	10
Vaseline	2
Squalane	18
Butyl paraben	0.1
Propyl paraben	0.1
Glycerol monooleate	3
Diglyceroldiisostearate	2
PEG400 dioleate	1
Glycerol	10
Dipropylene glycol	5
Purified water	To total amount 100

Example 8-8: Cosmetic lotion

	(% by weight)
Vitamin A	0.001
BHT inclusion- $\beta$ -HPCD (BHT: $\beta$ -HPCD = 1:100)	5
Glycerol	2
Citric acid	0.03
Trisodium citrate	0.07
Ethanol	5
Methyl paraben	0.1
Purified water	To total amount 100

Example 8-9: Beauty powder

	(% by weight)
Vitamin A	0.3
$\alpha$ -tocopherol inclusion- $\alpha$ -CD ( $\alpha$ -tocopherol: $\alpha$ -CD = 1:150)	10
Ultraviolet absorber inclusion- $\beta$ -HPCD* (Ultraviolet absorber: $\beta$ -HPCD = 1:150)	30
D-mannitol	To total amount 100

\* Ultraviolet absorber: Octylmethoxycinnamate

The external skin treatment compositions of Examples 8-5 to 8-9 were excellent in the stability of vitamin A in daily use.

As described hereinabove, in the external skin treatment composition of the present invention by formulating cyclodextrin including an antioxidant and/or an ultraviolet absorber, the stability of vitamin A can be extremely improved.

## Examples 9-1 to 9-2 and Comparative Examples 9-1 to 9-2

Table 9-1

Vitamin A stability determination results in emulsion (% by weight)				
	Example 9-1	Example 9-2	Comp. Example 9-1	Comp. Example 9-2
Purified water	To total amount 100			
Glycerol	10	10	10	10
Carboxyvinyl polymer	0.2	0.2	0.2	0.2
Caustic potash	0.06	0.06	0.06	0.06
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Cetyl alcohol	2	2	2	2
Vaseline	3	3	3	3
Squalane	5	5	5	5
Isopropyl myristate	4	4	4	4
Butylhydroxytoluene	0.05	0.05	0.05	0.05
Glyceryl monostearate	1.5	1.5	1.5	1.5
POE(60) hydrogenated castor oil	2	2	2	2
1,3-butanediol	0.01	5	-	-
Propylene glycol	-	-	5	-
Dipropylene glycol	-	-	-	5
Vitamin A	0.3	0.3	0.3	0.3
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After one month at 40 °C (%)	93	92	65	69

In Examples 9-1 and 9-2, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

Example 9-3: Cream

		(% by weight)
A.	Cetanol	3
	Glycerylmonostearate	2
	POE(25) Cetyl ether	1
	Stearic acid	3
	Vaseline	3
	Olive oil	3
	Isopropyl myristate	1
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	1,2-butanediol	3
	1,3-butanediol	3
	1,4-butanediol	3
	Potassium hydroxide	0.2
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70 °C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream

Example 9-4: Beauty essence

	(% by weight)
Carboxyvinyl polymer	0.3
1,3-butanediol	25
1,4-butanediol	15
Glycerol	30
Triethanolamine	3.5
POE(60) hydrogenated castor oil	0.5
Vitamin A	0.1
Squalane	1
$\alpha$ -tocopherol	0.01
Methyl paraben	0.2
Ethyl alcohol	6
Purified water	To total amount 100



Example 9-5: Cosmetic lotion

	(% by weight)
1,3-butanediol	5
Ethanol	7
POE(50) Oleyl ether	0.5
Oleyl alcohol	0.002
Vitamin A	0.0001
BHT	0.001
Citric acid	0.03
Trisodium citrate	0.07
Methyl paraben	0.1
Disodium edetate	0.03
Purified water	To total amount 100

Example 9-6: Oil essence

	(% by weight)
Vitamin A	1
Glycerol tri 2-ethylhexanoate	69
Olive oil	10
BHT	1
$\alpha$ -tocopherol	9
1,3-butanediol	5
Squalane	5

Example 9-7: Night cream

	(% by weight)
Vaseline	4
Squalane	15
Liquid paraffin	5
Cetyl octanoate	5
Glycerylmonooleate	4
POE(5) hydrogenated castor oil	1
Butyl paraben	0.2
Vitamin A	0.2
1,4-butanediol	2
1,3-butanediol	8
Glycerol	12
Trisodium edetate	0.03
Purified water	To total amount 100

The external skin treatment compositions of Examples 9-3 to 9-7 were excellent in the stability of vitamin A in daily use. As described hereinabove, in the external skin treatment composition of the present invention, by formulating butanediol and an oil-soluble antioxidant, stability of vitamin A can be extremely improved.

## Examples 10-1, 10-2 and Comparative Examples 10-1, 10-2

Tocopherol, octylmethoxycinnamate, oleyl alcohol, methyl paraben, POE(20) octyldodecyl ether are completely dissolved in ethanol at 40 °C, thereafter, vitamin A is completely dissolved therein, and the solution is quickly cooled to form an alcohol portion. The resulting alcohol portion is added to an aqueous portion wherein other components are dissolved in purified water, and sealed in a brown glass sample tube. The tube is further wrapped with aluminum foil to completely cut light and is stored in a constant temperature bath at 40 °C.

Table 10-1

Vitamin A stability determination results in lotion (% by weight)				
	Example 10-1	Example 10-2	Comp. Example 10-1	Comp. Example 10-2
Vitamin A	0.001	0.001	0.001	0.001
Oleyl alcohol	0.005	0.005	0.005	0.005
Octylmethoxycinnamate	-	-	0.001	-
Benzophenone-5	0.001	0.1	-	-
Benzophenone-3	-	-	-	0.01
POE(20)Octyldodecyl ether	0.8	0.8	0.8	0.8
Ethanol	18	18	18	18
Glycerol	3	3	3	3
Methyl paraben	0.1	0.1	0.1	0.1
Citric acid	0.03	0.03	0.03	0.03
Trisodium citrate	0.07	0.07	0.07	0.07
Tetrasodium edetate	0.02	0.02	0.02	0.02
Purified water	To total amount 100			
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After one month at 40 °C (%)	92	95	49	52

## Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

In Examples 10-1 and 10-2, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect produced by the addition of a water-soluble benzophenone compound according to the present invention.

## Examples 10-3 to 10-4 and Comparative Examples 10-3 to 10-4

Table 10-2

5	Emulsion formulation and vitamin A quantitative determination results (% by weight)				
		Example 10-3	Example 10-4	Comp. Example 10-3	Comp. Example 10-3
10	Vitamin A	0.3	0.01	0.3	0.01
	BHT	0.05	0.01	0.05	0.01
	d1- $\alpha$ -tocopherol	0.01	0.02	0.01	0.02
	Benzophenone-5	0.1	0.05	-	-
15	Benzophenone-9	-	0.05	-	-
	Octylmethoxycinnamate	-	-	0.1	-
	Methoxybenzoylmethane*	-	-	-	0.1
	Cetyl isooctanoate	10	7	10	7
	Squalane	5	5	5	5
20	Cetyl alcohol	2	2	2	2
	Vaseline	1	1	1	1
	Glyceryl monostearate	1.5	1.5	1.5	1.5
	POE(60) hydrogenated castor oil	1.3	1.3	1.3	1.3
	Carboxyvinyl polymer	0.2	0.3	0.2	0.3
25	Caustic potash	0.06	0.08	0.06	0.08
	Glycerol	10	10	10	10
	Propylene glycol	3	3	3	3
	Ethyl paraben	0.2	0.2	0.2	0.2
	Purified water	To total amount 100			
30	Vitamin A quantitative determination value				
	Immediately after preparation (%)	100	100	100	100
	After one month at 40 °C (%)	97	99	29	22
	*4-(1,1-dimethylethyl)-4'-methoxybenzoylmethane				

\*4-(1,1-dimethylethyl)-4'-methoxybenzoylmethane

Each oil component containing BHT, and tocopherol, and a surfactant are completely dissolved at 70 °C, thereafter, immediately before emulsification, vitamin A is completely dissolved therein to form an oil phase.

Glycerol, propylene glycol, carboxyvinyl polymer, caustic potash, benzophenone-9 and benzophenone-5 are completely dissolved in purified water. The oil phase is added to the resulting aqueous phase heated to 70 °C, then the mixture obtained is emulsified by a homomixer type emulsifier. Then, the resulting product is subjected to a cooling treatment by a heat exchanger to 30 °C to form an emulsion.

The emulsion is filled in a glass bottle having a metal coat applied thereto, which is tightly sealed and is stored in a constant temperature bath at 40 °C.

In Examples 10-3 to 10-4, as compared with the Comparative Example, the stability of vitamin A is improved. This is the effect according to the present invention.

## Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol, the quantitative determination was effected. A sample was prepared by removing vitamin A from Example and Comparative Example (control) and the absorption at 325 nm was measured, which was used for correcting an absorbance as the absorbance of a base material.

(Absorbance of a sample of Example and Comparative Example at 325 nm) - (Absorbance of a control) = Absorbance of vitamin A

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In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used.

## Example 10-5: Cosmetic lotion

	(% by weight)
Oleyl alcohol	0.002
Vitamin A	0.0001
POE(50) Oleyl ether	0.7
Lactic acid	0.01
Trisodium citrate	0.09
Ethanol	8
Glycerol	2
Methyl paraben	0.2
Benzophenone-12	2.5
Benzophenone-5	2.5
Purified water	To total amount 100

## Example 10-6: Oil essence

	(% by weight)
Glycerol tri 2-ethylhexanoate	34
Isopropyl myristate	35
Dibutyl phthalate	10
Vitamin A	1
Diglyceroldiisostearate	5
Dipropylene glycol	14.997
Benzophenone-4	0.001
Trisodium citrate	0.002

Example 10-7 Cream

	(% by weight)
Squalane	15
Glycerol tri 2-ethylhexanoate	8
Isopropyl myristate	7
$\alpha$ -tocopherol	0.05
Vitamin A	0.3
Vaseline	2
Butyl paraben	0.1
Propyl paraben	0.1
Glycerol monooleate	3
Diglyceroldiisostearate	2
PEG400 dioleate	1
Glycerol	10
Dipropylene glycol	5
Disodium edetate	0.01
Benzophenone-4	0.03
Triethanolamine	0.04
Purified water	To total amount 100

Example 10-8 Oil gel

	(% by weight)
Glycerol tri 2-ethylhexanoate	60
POE(20) octyldodecyl ether	16
Vitamin A	0.1
Glycerol	16
Benzophenone-5	0.05
Purified water	To total amount 100

The external skin treatment compositions of Examples 10-5 to 10-8 were excellent in the stability of vitamin A in daily use. As described hereinabove, in the external skin treatment composition of the present invention, by formulating a water-soluble benzophenone compound, stability of vitamin A can be extremely improved.

Examples 11-1 to 11-3 and Comparative Example 11-1

Table 11-1

Vitamin A stability determination results in emulsion (% by weight)				
	Example 11-1	Example 11-2	Example 11-3	Comp. Example 11-1
Purified water	To total amount 100			
Glycerol	10	10	10	10
Carboxyvinyl polymer	0.2	0.2	0.2	0.2
Arginine	0.21	0.28	0.42	0.06
Caustic potash	-	-	-	0.06
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Cetyl alcohol	2	2	2	2
Vaseline	3	3	3	3
Squalane	5	5	5	5
Isopropyl myristate	4	4	4	4
Glycerylmonostearate	1.5	1.5	1.5	1.5
POE(60) hydrogenated castor oil	2	2	2	2
Butylhydroxytoluene	0.05	0.05	0.05	0.05
Vitamin A	0.3	0.3	0.3	0.3
pH (25 °C)	5.7	6.6	7.4	5.8
Vitamin quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After one month at 40 °C (%)	90	92	95	71

In Examples 11-1, 11-2, and 11-3, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

Example 11-4: Cream

		(% by weight)
A.	Cetanol	3
	Glycerylmonostearate	2
	POE(25) Cetyl ether	2
	Stearic acid	3
	Vaseline	2
	Olive oil	3
	Isopropyl myristate	3
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	Propylene glycol	3
	Potassium hydroxide	0.27
	Arginine	0.001
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70°C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream. (pH = 7.3)

Example 11-5. Beauty essence

	(% by weight)
Carboxyvinyl polymer	0.4
Glycerol	5
Propyl glycol	5
Lysine	0.5
Arginine	4.8
POE(60) hydrogenated castor oil	0.5
Vitamin A	0.1
Squalane	1
$\alpha$ -tocopherol	0.05
Methyl paraben	0.2
Ethyl alcohol	6
Purified water	To total amount 100
pH = 6.7	

Example 11-6: Cosmetic lotion

	(% by weight)
Glycerol	2
Ethanol	7
POE(50) Oleyl ether	0.5
Oleyl alcohol	0.002
Vitamin A	0.0001
Lactic acid	0.03
Arginine	0.1
Ornithine hydrochloride	1
Methyl paraben	0.1
Purified water	To total amount 100
pH = 6.2	

Example 11-7: Oil gel

	(% by weight)
Vitamin A	0.5
Glycerol tri 2-ethylhexanoate	40
Olive oil	10
BHT	0.1
BHA	0.05
PHE(20) octyldodecyl ether	16
Glycerol	15
Lysine hydrochloride	0.1
Purified water	To total amount 100
pH = 5.5	

Example 11-8: Night cream

	(% by weight)
Solid paraffin	1
Microcrystalline wax	2
Beeswax	1
Squalane	15
Glycerol tri 2-ethylhexanoate	10
Diglycerol diisostearate	3
PEG400 diisostearate	1
Propyl paraben	0.2
Vitamin A	0.3
Glycerol	10
Propylene glycol	4
Arginine	0.2
Pyrrolidone carboxylic acid	0.2
Purified water	To total amount 100



The external skin treatment compositions of Examples 11-4 to 11-8 were excellent in the stability of vitamin A in daily use.

In the external skin treatment composition of the present invention, by formulating a basic amino acid and/or the salt thereof, stability of vitamin A can be extremely improved.

5  
Examples 12-1 to 12-3 and Comparative Example 12-1

Table 12-1

Vitamin A stability determination results in emulsion (% by weight)				
	Example 12-1	Example 12-2	Example 12-3	Comp. Example 12-1
Purified water	To total amount 100			
Glycerol	10	10	10	10
Carboxyvinyl polymer	0.2	0.2	0.2	0.2
Caustic potash	0.06	0.06	0.06	0.06
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Cetyl alcohol	2	2	2	2
Butyl alcohol	1	1	1	1
Vaseline	3	3	3	3
Squalane	5	5	5	5
Isopropyl myristate	4	4	4	4
Glycerylmonostearate	1.5	1.5	1.5	1.5
POE(60) hydrogenated castor oil	2	2	2	2
BHT	0.03	0.03	0.03	0.03
Trisodium edetate	0.02	0.02	0.02	0.02
Arginine aspartate	0.03	0.03	-	-
Monosodium glutamate	-	0.5	0.01	-
Vitamin A	0.3	0.3	0.3	0.3
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After two months at 40 °C (%)	90	96	90	69

In Examples 12-1, 12-2 and 12-3, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

Example 12-4: Cream

		(% by weight)
5	A.	
	Cetanol	3
	Glycerylmonostearate	2
	POE(25) Cetyl ether	1
	Stearic acid	3
10	Vaseline	3
	Olive oil	3
	Isopropyl myristate	1
	Squalane	5
	Vitamin A	0.1
15	BHT	0.05
	Perfume	q.s.
	B.	
	Propylene glycol	3
	Potassium hydroxide	0.2
20	Monosodium glutamate	5
	Purified water	To total amount 100

25 The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70 °C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream.

Example 12-5: Beauty essence

		(% by weight)
30	Carboxyvinyl polymer	0.4
	Glycerol	5
	Propylene glycol	5
35	Arginine aspartate	0.001
	Triethanolamine	3.4
	POE(60) hydrogenated castor oil	0.5
	Vitamin A	0.001
	Squalane	1
40	$\alpha$ -tocopherol	1
	Methyl paraben	0.2
	Ethyl alcohol	6
	Purified water	To total amount 100

Example 12-6: Cosmetic lotion

	(% by weight)
Glycerol	2
Ethanol	7
POE(50) Oleyl ether	0.5
Oleyl alcohol	0.002
Vitamin A	0.0001
Aspartic acid	0.001
Lactic acid	0.02
Sodium lactate	0.1
Methyl paraben	0.1
Purified water	To total amount 100

Example 12-7: Oil gel

	(% by weight)
Vitamin A	1
Glycerol tri 2-ethylhexanoate	40
Olive oil	19
BHT	0.1
BHA	0.05
POE(20) octyldodecyl ether	16
Glycerol	15
Sodium glutamate	0.01
Purified water	To total amount 100

Example 12-8: Beauty liquid

	(% by weight)
Vitamin A	0.3
Isopropyl myristate	3
POE(60) hydrogenated castor oil	0.6
Gum xanthane	0.8
Glycerol	30
Propylene glycol	5
Sodium pyrrolidone carboxylate (50%)	20
Ethanol	6
Methyl paraben	0.1
Purified water	To total amount 100

Example 12-9: Night cream

	(% by weight)
Squalane	15
Microcrystalline wax	4
Isopropyl myristate	5
Vaseline	4
Octyl dodecanol	2
Butyl paraben	0.15
Vitamin A	0.2
Diglycerol diisostearate	4
Glycerol	3
Propylene glycol	3
Sodium glutamate	1
Purified water	To total amount 100

The external skin treatment compositions of Examples 12-4 to 12-9 were excellent in the stability of vitamin A in daily use.

In the external skin treatment composition of the present invention, by formulating an acidic amino acid and/or the salt thereof, stability of vitamin A can be extremely improved.

Examples 13-1 to 13-3 and Comparative Examples 13-1 to 13-2

Table 13-1

Vitamin A stability determination results in oil (% by weight)					
	Example 13-1	Example 13-2	Example 13-3	Comp. Example 13-1	Comp. Example 13-2
Vitamin A	1	1	1	1	1
Pentaerythritol ester	99	49	-	-	-
Trimethylolpropane ester	-	50	99	-	-
Squalane	-	-	-	99	-
Cetylisooctanoate	-	-	-	-	99
Vitamin A quantitative determination value					
Immediately after preparation (%)	99	100	99	100	100
After one month at 40°C (%)	96	94	92	40	51
Pentaerythritol ester: pentaerythrito-tetra(2-ethylhexanoate) ester					
Trimethylolpropane ester: trimethylolpropane-tri(2-ethyl-hexanoate) ester					

Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

In Examples 13-1, 13-2, and 13-3, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

Examples 13-4, 13-5 and Comparative Examples 13-3, 13-4

BHT and tocopherol are each completely dissolved in oil at 60 °C, then the resulting solution is cooled to 40 °C. Thereafter, vitamin A is completely dissolved therein. The resulting solution is filled in a brown glass sample tube and is stored in a constant temperature bath at 40 °C.

Table 13-2

Cosmetic oil formulation and vitamin A stability determination results (% by weight)				
	Example 13-4	Example 13-5	Comp. Example 13-3	Comp. Example 13-4
Trimethylolpropane (2-ethylhexanoate)	75	10	-	-
Pentaerythritol (2-ethylhexanoate)	-	80	-	-
Dimethylpolysiloxane	-	9.76	-	39.76
Isopropylmyristate	-	-	15	60
Squalane	24.985	-	84.985	-
Vitamin A	0.01	0.2	0.01	0.2
BHT	0.005	0.03	0.005	0.03
d1- $\alpha$ -tocopherol	-	0.01	-	0.01
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After two months at 40 °C (%)	96	97	59	73

In Examples 13-4 and 13-5, as compared with the Comparative Example, the stability of vitamin A is improved. This is the effect according to the present invention.

Production method and temperature test method of Examples 13-6, 13-7 and Comparative Examples 13-5, 13-6

BHT, tocopherol and each oil and a surfactant are completely dissolved at 70 °C, thereafter, immediately before emulsification, vitamin A is completely dissolved therein to form an oil phase.

Glycerol, propylene glycol, carboxyvinyl polymer and caustic potash are completely dissolved in purified water. The oil phase is added to the resulting aqueous phase heated to 70 °C, then the mixture obtained is emulsified by a homomixer type emulsifier. Then the resulting product is subjected to a cooling treatment by a heat exchanger to 30 °C to form an emulsion.

The emulsion is filled in a glass bottle having a metal coat applied thereto, which is tightly sealed and is stored in a constant temperature bath at 40 °C.

Table 13-3

Emulsion formulation and vitamin A quantitative determination results (% by weight)					
	Example 13-6	Example 13-7	Comp. Example 13-5	Comp. Example 13-6	
5					
	Pentaerythritol (2-ethylhexanoate)	10	4	-	-
	Trimethylolpropane (2-ethylhexanoate)	-	3	-	-
10	BHT	0.05	0.01	0.05	0.01
	d1- $\alpha$ -tocopherol	0.01	0.02	0.01	0.02
	Vitamin A	0.3	0.01	0.3	0.01
	Cetylisooctanoate	-	-	10	7
	Squalane	5	2	5	2
15	Cetyl alcohol	2	2	2	2
	Vaseline	1	1	1	1
	Glyceryl monostearate	1.5	1.5	1.5	1.5
	POE(60) Hydrogenated castor oil	1.3	1.3	1.3	1.3
	Carboxyvinyl polymer	0.2	0.2	0.2	0.2
20	Caustic Potash	0.06	0.06	0.06	0.06
	Glycerol	10	10	10	10
	Propylene glycol	3	3	3	3
	Ethyl paraben	0.2	0.2	0.2	0.2
	Purified water	To total amount 100			
25	Vitamin A quantitative determination value				
	Immediately after preparation (%)	100	100	100	100
	After one month at 40 °C (%)	98	96	32	25

In Examples 13-6 and 13-7, the stability of vitamin A is improved as compared with the Comparative Example. This is the effect according to the present invention.

#### Quantitative determination method of vitamin A

According to the absorbance determination method at 325 nm using ethanol, the quantitative determination was effected.

In the calculation, at the maximum absorption 325 nm,  $E(1\%, 1\text{ cm}) = 1835$  was used

#### Example 13-8: Cosmetic lotion

	(% by weight)
Pentaerythritoltetracaprate	0.002
$\delta$ -tocopherol	0.001
$\alpha$ -tocopherol	0.0005
Vitamin A	0.0001
POE(50) Oleylether	0.7
Lactic acid	0.1
Sodium lactate	0.9
Ethanol	5
Glycerol	1
Methyl paraben	0.2
Trisodium edetate	0.01
Purified water	To total amount 100

Example 13-9: Oil essence

	(% by weight)
Pentaerythritoltetra (2-hexanoate)	60
Trimethylolpropanetricaprate	10
Squalane	10
BHT	1
$\alpha$ -tocopherol	9
Vitamin A	5

Example 13-10: Cream

	(% by weight)
Glycerol tri 2-ethylhexanoate	10
Pentaerythritoltetra(2-ethylhexanoate)	15
BHT	0.05
BHA	0.01
$\alpha$ -tocopherol	0.01
Vitamin A	0.3
Vaseline	2
Squalane	8
Butyl paraben	0.1
Propyl paraben	0.1
Glycerol monooleate	3
Diglycerol diisostearate	2
PEG400 dioleate	1
Glycerol	10
Dipropylene glycol	5
Purified water	To total amount 100

Example 13-11: Eye wrinkle oil

	(% by weight)
Pentaerythritoltetra(2-ethylhexanoate)	40
Trimethylolpropanetricaprate	20
Glycerol tri 2-ethylhexanoate	20
Squalane	19
Acetic acid palmitate	1

The external skin treatment compositions of Examples 13-8 to 13-11 were excellent in the stability of vitamin A in daily use.

In the external skin treatment composition of the present invention, by formulating at least one polar oil component selected from the group consisting of pentaerythritol fatty acid ester and trimethylol propane fatty acid ester, the stability of vitamin A can be improved.

In accordance with the present invention, by formulating at least one polar oil selected from the group consisting of pentaerythritol fatty acid ester and trimethylolpropane fatty acid ester, and at least one oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha$ , $\beta$ , $\gamma$ , $\delta$ -tocopherol, nordihydroguaiaretin, propyl gallate, a fatty acid ester of vitamin C and sorbic acid, the stability of vitamin A can be further noticeably improved.

Examples 14-1 to 14-2 and Comparative Examples 14-1 to 14-2

Table 14-1

Vitamin A stability determination results in emulsion (% by weight)				
	Example 14-1	Example 14-2	Comp. Example 14-1	Comp. Example 14-2
Purified water	To total amount 100			
Glycerol	10	10	10	10
Ethyl alcohol	5	5	5	5
Methyl paraben	0.1	0.1	0.1	0.1
Glyceryl monostearate	1.5	1.5	1.5	1.5
POE(60) hydrogenated castor oil	2	2	2	2
Cetyl alcohol	2	2	2	2
Isopropyl myristate	4	4	4	4
Vaseline	3	3	3	3
Squalane	5	5	5	5
BHT	-	0.05	-	0.05
Trisodium edetate	-	0.03	-	0.03
Natural montmorillonite	2	2	-	-
Vitamin A	0.3	0.3	0.3	0.3
Vitamin A quantitative determination value				
Immediately after preparation (%)	100	100	100	100
After one month at 40 °C (%)	90	95	53	68

\*Natural montmorillonite: Trade name Kunipia G-4

Quantitative determination method of vitamin A

In accordance with the second method of vitamin A quantitative determination method, Japanese Pharmacopoeia (11th revision), the quantitative determination was effected by an absorbance determination method using isopropanol.

In Examples 14-1, 14-2, the stability of vitamin A is improved as compared with Comparative Example. This is the effect according to the present invention.



Table 14-2

Emulsion formulation and vitamin A quantitative determination results (% by weight)					
	Example 14-3	Example 14-4	Comp. Example 14-3	Comp. Example 14-4	
5					
	Natural saponite (Veegum HV)	3	3	-	-
	Ascorbic acid	0.1	-	0.1	-
	BHT	0.05	0.01	0.05	0.01
10	d1- $\alpha$ -tocopherol	0.01	0.02	0.01	0.02
	Vitamin A	0.3	0.01	0.3	0.01
	Cetylisooctanoate	10	7	10	7
	Squalane	5	2	5	2
	Cetyl alcohol	2	2	2	2
15	Vaseline	1	1	1	1
	Glyceryl monostearate	1.5	1.5	1.5	1.5
	POE(60) hydrogenated castor oil	1.3	1.3	1.3	1.3
	Glycerol	10	10	10	10
20	Propylene glycol	3	3	3	3
	Methyl paraben	0.2	0.2	0.2	0.2
	Purified water	To total amount 100			
Vitamin A quantitative determination value					
25	Immediately after preparation (%)	100	100	100	100
	After one month at 40 °C (%)	95	92	63	51

## Example 14-5: Cream

		(% by weight)
A.	Cetanol	3
	Glycerylmonostearate	2
	POE(25) cetyl ether	1
	Stearic acid	3
	Vaseline	3
	Olive oil	3
	Isopropyl palmitate	1
	Squalane	5
	Vitamin A	0.1
	BHT	0.05
	Perfume	q.s.
B.	Propylene glycol	3
	Potassium hydroxide	0.2
	Synthetic saponite (Trade name: Smectone SA)	0.1
	Citric acid	0.001
	Purified water	To total amount 100

The oil phase portion (A) and the aqueous phase portion (B) are thermally melted at 70 °C, then A is added to B, the resulting mixture is emulsified, and subsequently subjected to a cooling treatment to form a cream.

Example 14-6: Beauty gel

	(% by weight)
Synthetic heclite (Trade name: Laponite XLG)	10
Glycerol	15
Propylene glycol	5
Citric acid	0.5
Triethanolamine	1.8
2-hydroxy-4-methoxybenzophenone-5-sodium sulfonate	1
POE(60) hydrogenated castor oil	0.5
Vitamin A	0.1
Octylmethoxycinnamate	9
Methyl paraben	0.2
Ethyl alcohol	3
Purified water	To total amount 100

Example 14-7: Cosmetic lotion

	(% by weight)
Glycerol	2
Ethanol	7
POE(50) Oleyl ether	0.5
Oleyl alcohol	0.002
Vitamin A	0.0001
Synthetic saponite (Trade name: Smectone SA)	0.01
Lactic acid	0.01
Sodium lactate	0.09
Methyl paraben	0.1
Purified water	To total amount 100

Example 14-8: Cream

	(% by weight)
Squalane	15
Glycerol tri 2-ethylhexanoate	10
Olive oil	10
Butyl paraben	0.2
Diglycerol diisostearate	2
Glycerylmonooleate	2
Natural saponite (Trade name: Veegum HV)	3
Dimethylstearylammmoniumchloride	1.0
Vitamin A	0.5
BHT	0.1
Disodium edetate	0.01
Ascorbic acid	0.01
Sodium isoascorbate	0.01
2-hydroxy-4-methoxybenzophenone	0.3
Glycerol	10
Phenoxy ethanol	0.1
Purified water	To total amount 100

Example 14-9: Oil gel

	(% by weight)
Vitamin A	1
Glycerol tri 2-ethylhexanoate	40
$\alpha$ -tocopherol	9
Squalane	10
Natural montmorillonite (Trade name: Kunipia G)	10
Natural saponite (Trade name: Veegum HV)	10
BHT	1
2-ethylhexyl paradimethylbenzoate	10
POE(20) hydrogenated castor oil	6
Purified water	4

Example 14-10: Beauty powder

	(% by weight)
Synthetic heclite (Trade name: Laponite XLG)	50
D-mannitol	48
Isopropyl palmitate	1.9
Vitamin A	0.1

Example 14-11: Beauty essence

	(% by weight)
Synthetic heclite (Trade name: Laponite XLG)	3
Synthetic saponite (Trade name: Smectone SA)	1
Glycerol	20
Propylene glycol	5
Citric acid	0.03
Trisodium citrate	0.07
$\alpha$ -tocopherol	1
2-hydroxy-4-methoxybenzophenone-5-Sodium sulfonate	0.5
4-t-butyl-4'-methoxydibenzoylmethane	0.1
POE(60) hydrogenated castor oil	0.5
Vitamin A	0.1
Sodium hexametaphosphate	0.02
Methyl paraben	0.2
Ethyl alcohol	3
Purified water	To total amount 100

The external skin treatment compositions of Examples 14-5 to 14-11 were excellent in the stability of vitamin A in daily use.

In the external skin treatment composition of the present invention, by formulating at least one water-swellable clay mineral, the stability of vitamin A can be improved.

In accordance with the present invention, by formulating at least one water-swellable clay mineral and at least one antioxidant, chelating agent and ultraviolet absorber, the stability of vitamin A can be further noticeably improved.

**Claims**

1. An external skin treatment composition comprising (I) vitamin A and (II) at least one stabilizer selected from the group consisting of (1) chelating agents and polysaccharides, (2) oil components having an iodine value of 70 or more, (3) polyethylene glycols and/or polypropylene glycols, (4) hydroxy carboxylates, (5) neutral amino acids, (6) (i) at least one oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha,\beta,\gamma,\delta$ -tocopherol, nordihydroguaiaretin, propyl gallate, fatty acid esters of vitamin C and sorbic acid, (ii) at least one ethylenediaminetetraacetate and (iii) at least one benzophenone compound, (7) (i) at least one oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha,\beta,\gamma,\delta$ -tocopherol, nordihydroguaiaretin, propyl gallate and fatty acid esters of vitamin C, (ii) at least one compound selected from the group consisting of ascorbic acid, ascorbic acid salts, isoascorbic acid, isoascorbic acid salts, sorbic acid and sorbic acid salts and (iii) at least one benzophenone compound, (8) inclusion compounds of cyclodextrins including an antioxidant and/or an ultraviolet absorber, (9) at least one butanediol and/or at least one oil-soluble antioxidant, (10) at least one water-soluble benzophenone compound, (11) at least one compound selected from the group consisting of basic amino acids and the salts thereof, (12) at least one compound selected from the group consisting of acidic amino acids and the salts thereof, (13) at least one polar oil selected from the group consisting of pentaerythritol fatty acid esters and trimethylolpropane fatty acid esters, and (14) at least one water-swellable clay mineral.
2. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A, 0.001% by weight or more of a chelating agent and 0.00001% by weight or more of a polysaccharide on the basis of the total weight of the composition.
3. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.01% by weight or more of an oil having an iodine value of 70 or more on the basis of the total weight of the composition.

4. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A, polyethylene glycol and/or polypropylene glycol on the basis of the total weight of the composition.
5. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.001% by weight or more of hydroxycarboxylate on the basis of the total weight of the composition.
6. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.001% by weight or more of a neutral amino acid on the basis of the total weight of the composition.
7. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A, and
  - (A) 0.001% by weight or more of an oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha$ , $\beta$ , $\gamma$ , $\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate, fatty acid esters of vitamin C and sorbic acid,
  - (B) 0.001% by weight or more of ethylenediaminetetraacetate,
  - (C) 0.001% by weight or more of a benzophenone compound on the basis of the total weight of the composition.
8. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A, and
  - (A) 0.001% by weight or more of an oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydroxyanisole,  $\alpha$ , $\beta$ , $\gamma$ , $\delta$ -tocopherols, nordihydroguaiaretin, propyl gallate and a fatty acid ester of vitamin C,
  - (B) 0.001% by weight or more of ascorbic acid, ascorbic acid salt, isoascorbic acid, isoascorbic acid salt, sorbic acid and sorbic acid salt, and
  - (C) 0.001% by weight or more of a benzophenone compound on the basis of the total weight of the composition.
9. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A, 0.01% by weight or more of cyclodextrin including 0.001% by weight or more of an antioxidant and or 0.001% by weight or more of an ultraviolet absorber on the basis of the total weight of the composition.
10. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A, 0.01% by weight or more of butanediol and 0.001% by weight or more of an oil-soluble antioxidant on the basis of the total weight of the composition.
11. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.001% by weight or more of a water-soluble benzophenone compound on the basis of the total weight of the composition.
12. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.001% by weight or more of a basic amino acid and the salt thereof on the basis of the total weight of the composition.
13. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.0001 part by weight or more of at least one kind of an acidic amino acid and an acidic amino acid salt on the basis of the total weight of the composition.
14. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.002% by weight or more of a polar oil selected from the group consisting of pentaerythritol fatty acid ester and trimethylolpropane fatty acid ester on the basis of the total weight of the composition.

15. A composition as claimed in claim 14, wherein the composition comprises 0.001% by weight or more of an oil-soluble antioxidant selected from the group consisting of butyl hydroxytoluene, butyl hydrox-  
yanisole,  $\alpha$ , $\beta$ , $\gamma$ , $\delta$ -tocopherols, nordihydrogualeatin, propyl gallate, a fatty acid ester of vitamin C and  
sorbic acid on the basis of the total weight of the composition.
- 5 16. A composition as claimed in claim 1, wherein the composition comprises 0.0001% by weight or more of vitamin A and 0.01% by weight or more of a water-soluble clay mineral on the basis of the total weight of the composition.
- 10 17. A composition as claimed in claim 16, wherein the composition comprises 0.001% by weight or more of an antioxidant, chelating agent and ultraviolet absorber.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP93/00969

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl. <sup>5</sup> A61K7/00, A61K7/48 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols): Int. Cl. <sup>5</sup> A61K7/00, 7/48, 9/06, 9/08 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP, A, 63-135309 (Shiseido Co., Ltd.), June 7, 1988 (07. 06. 88), (Family: none)	1-7, 10-13, 16-17
X	JP, A, 1-246208 (Shiseido Co., Ltd.), October 2, 1989 (02. 10. 89), (Family: none)	1, 3-5, 8, 10-11
X	JP, A, 1-186811 (Sunstar Corp.), July 26, 1989 (26. 07. 89), (Family: none)	1, 3, 10
X	JP, A, 62-419 (Shiseido Co., Ltd.), January 6, 1987 (06. 01. 87), (Family: none)	1, 16
A	JP, A, 2-142713 (Shiseido Co., Ltd.), May 31, 1990 (31. 05. 90), (Family: none)	1-17
A	JP, B2, 63-2926 (Ichiro Shibauchi, Kenji Nakamura), January 21, 1988 (21. 01. 88), (Family: none)	1-17
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search September 10, 1993 (10. 09. 93)		Date of mailing of the international search report September 28, 1993 (28. 09. 93)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.		Authorized officer Telephone No.